

(5) Except for recorders powered solely by the engine-driven electrical generator system, there is an automatic means to simultaneously stop a recorder that has a data erasure feature and prevent each erasure feature from functioning, within 10 minutes after crash impact; and

(b) Each nonejectable record container must be located and mounted so as to minimize the probability of container rupture resulting from crash impact and subsequent damage to the record from fire. In meeting this requirement the record container must be located as far aft as practicable, but need not be aft of the pressurized compartment, and may not be where aft-mounted engines may crush the container upon impact.

(c) A correlation must be established between the flight recorder readings of airspeed, altitude, and heading and the corresponding readings (taking into account correction factors) of the first pilot's instruments. The correlation must cover the airspeed range over which the airplane is to be operated, the range of altitude to which the airplane is limited, and 360 degrees of heading. Correlation may be established on the ground as appropriate.

(d) Each recorder container must:

(1) Be either bright orange or bright yellow;

(2) Have reflective tape affixed to its external surface to facilitate its location under water; and

(3) Have an underwater locating device, when required by the operating rules of this chapter, on or adjacent to the container which is secured in such a manner that they are not likely to be separated during crash impact.

(e) Any novel or unique design or operational characteristics of the aircraft shall be evaluated to determine if any dedicated parameters must be recorded on flight recorders in addition to or in place of existing requirements. CITAS [Amdt. 23-35, 53 FR 26143, July 11, 1988]

§ 23.1461 Equipment containing high energy rotors.

(a) Equipment, such as Auxiliary Power Units (APU) and constant speed drive units, containing high energy ro-

tors must meet paragraphs (b), (c), or (d) of this section.

(b) High energy rotors contained in equipment must be able to withstand damage caused by malfunctions, vibration, abnormal speeds, and abnormal temperatures. In addition—

(1) Auxiliary rotor cases must be able to contain damage caused by the failure of high energy rotor blades; and

(2) Equipment control devices, systems, and instrumentation must reasonably ensure that no operating limitations affecting the integrity of high energy rotors will be exceeded in service.

(c) It must be shown by test that equipment containing high energy rotors can contain any failure of a high energy rotor that occurs at the highest speed obtainable with the normal speed control devices inoperative.

(d) Equipment containing high energy rotors must be located where rotor failure will neither endanger the occupants nor adversely affect continued safe flight.

[Amdt. 23-20, 42 FR 36969, July 18, 1977, as amended by Amdt. 23-49, 61 FR 5170, Feb. 9, 1996]

Subpart G—Operating Limitations and Information

§ 23.1501 General.

(a) Each operating limitation specified in §§ 23.1505 through 23.1527 and other limitations and information necessary for safe operation must be established.

(b) The operating limitations and other information necessary for safe operation must be made available to the crewmembers as prescribed in §§ 23.1541 through 23.1589.

[Amdt. 23-21, 43 FR 2319, Jan. 16, 1978]

§ 23.1505 Airspeed limitations.

(a) The never-exceed speed V_{NE} must be established so that it is—

(1) Not less than 0.9 times the minimum value of V_D allowed under § 23.335; and

(2) Not more than the lesser of—

(i) 0.9 V_D established under § 23.335; or
(ii) 0.9 times the maximum speed shown under § 23.251.

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(b) The maximum structural cruising speed V_{NO} must be established so that it is—

(1) Not less than the minimum value of V_C allowed under § 23.335; and

(2) Not more than the lesser of—

(i) V_C established under § 23.335; or

(ii) $0.89 V_{NE}$ established under paragraph (a) of this section.

(c) Paragraphs (a) and (b) of this section do not apply to turbine airplanes or to airplanes for which a design diving speed V_D/M_D is established under § 23.335(b)(4). For those airplanes, a maximum operating limit speed (V_{MO}/M_{MO} -airspeed or Mach number, whichever is critical at a particular altitude) must be established as a speed that may not be deliberately exceeded in any regime of flight (climb, cruise, or descent) unless a higher speed is authorized for flight test or pilot training operations. V_{MO}/M_{MO} must be established so that it is not greater than the design cruising speed V_C/M_C and so that it is sufficiently below V_D/M_D and the maximum speed shown under § 23.251 to make it highly improbable that the latter speeds will be inadvertently exceeded in operations. The speed margin between V_{MO}/M_{MO} and V_D/M_D or the maximum speed shown under § 23.251 may not be less than the speed margin established between V_C/M_C and V_D/M_D under § 23.335(b), or the speed margin found necessary in the flight test conducted under § 23.253.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964, as amended by Amdt. 23-7, 34 FR 13096, Aug. 13, 1969]

§ 23.1507 Operating maneuvering speed.

The maximum operating maneuvering speed, V_O , must be established as an operating limitation. V_O is a selected speed that is not greater than V_S/n established in § 23.335(c).

[Doc. No. 26269, 58 FR 42165, Aug. 6, 1993]

§ 23.1511 Flap extended speed.

(a) The flap extended speed V_{FE} must be established so that it is—

(1) Not less than the minimum value of V_F allowed in § 23.345(b); and

(2) Not more than V_F established under § 23.345(a), (c), and (d).

(i) V_F established under § 23.345; or

(ii) V_F established under § 23.457.

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(b) Additional combinations of flap setting, airspeed, and engine power may be established if the structure has been proven for the corresponding design conditions.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964; 30 FR 258, Jan. 9, 1965, as amended by Amdt. 23-50, 61 FR 5192, Feb. 9, 1996]

§ 23.1513 Minimum control speed.

The minimum control speed V_{MC} , determined under § 23.149, must be established as an operating limitation.

§ 23.1519 Weight and center of gravity.

The weight and center of gravity limitations determined under § 23.23 must be established as operating limitations.

§ 23.1521 Powerplant limitations.

(a) *General.* The powerplant limitations prescribed in this section must be established so that they do not exceed the corresponding limits for which the engines or propellers are type certificated. In addition, other powerplant limitations used in determining compliance with this part must be established.

(b) *Takeoff operation.* The powerplant takeoff operation must be limited by—

(1) The maximum rotational speed (rpm);

(2) The maximum allowable manifold pressure (for reciprocating engines);

(3) The maximum allowable gas temperature (for turbine engines);

(4) The time limit for the use of the power or thrust corresponding to the limitations established in paragraphs (b)(1) through (3) of this section; and

(5) The maximum allowable cylinder head (as applicable), liquid coolant and oil temperatures.

(c) *Continuous operation.* The continuous operation must be limited by—

(1) The maximum rotational speed;

(2) The maximum allowable manifold pressure (for reciprocating engines);

(3) The maximum allowable gas temperature (for turbine engines); and

(4) The maximum allowable cylinder head, oil, and liquid coolant temperatures.

(d) *Fuel grade or designation.* The minimum fuel grade (for reciprocating engines), or fuel designation (for turbine engines), must be established so that it is not less than that required for the